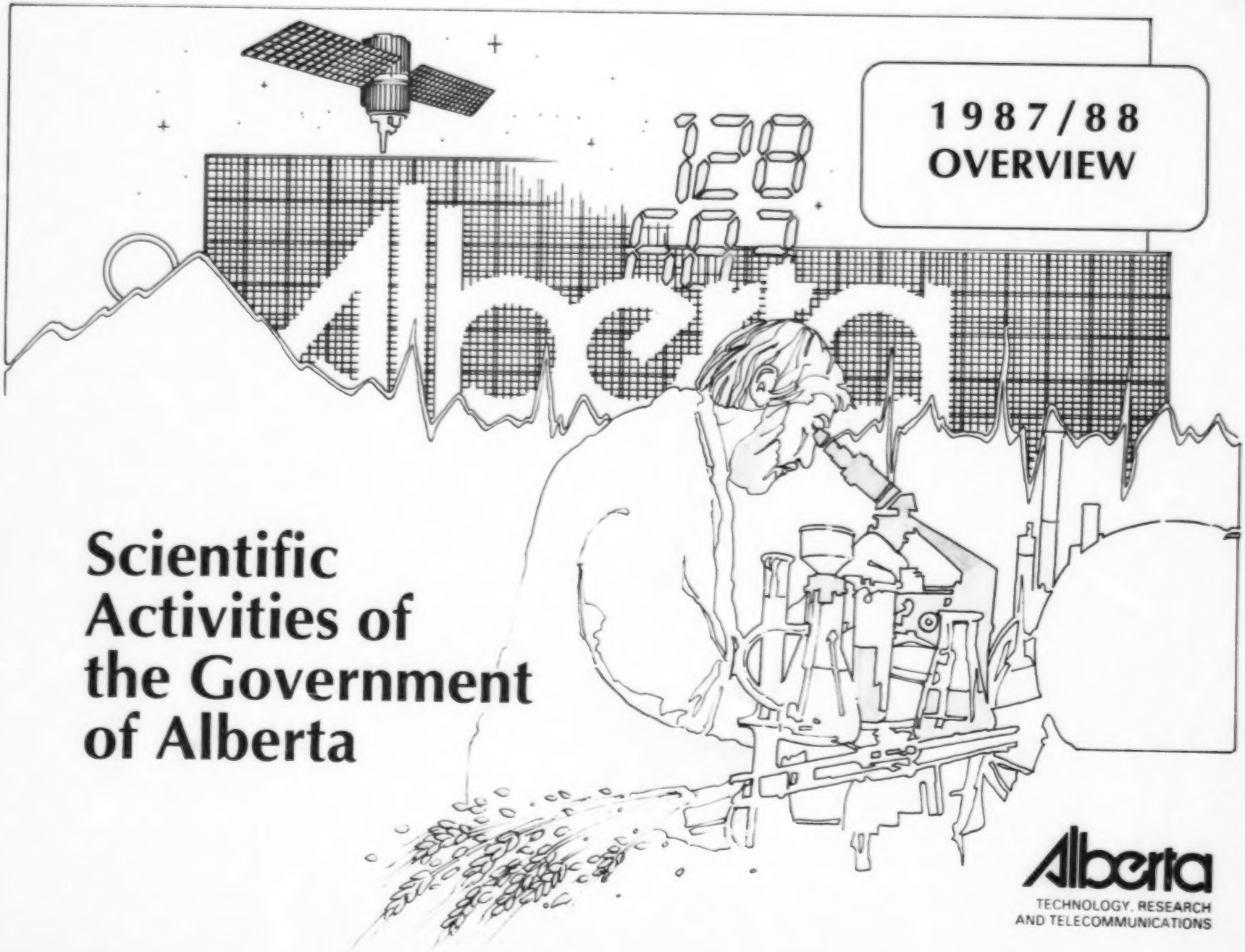

1987/88
OVERVIEW

Scientific Activities of the Government of Alberta

Alberta
TECHNOLOGY, RESEARCH
AND TELECOMMUNICATIONS

90-06782/

I. INTRODUCTION

The provincial government invests in science and technology that supports its public policy objectives in health improvement, environmental protection, industrial and social development, and the advancement of local scientific competence. Its science agenda is the sum of the programs and budgetary allocations of several departments and agencies. Technology, Research and Telecommunications, in cooperation with Statistics Canada, conducts an annual survey of the government's science activities. This publication is a brief overview of the results of the 1987/88 survey.

On its own, this survey offers a series of indicators of provincial government expenditures, the allocation of those expenditures, human resources, and provincial priorities/objectives in the scientific arena. These provincial indicators can provide significant input to policy formulation and program evaluation when used in conjunction with the indicators generated from companion surveys (to be published at a later date), in particular those relating to the federal government, the private sector, universities, and private non-profit institutions.

The term "indicator" is used deliberately. Specifically, a number of problems exist with data relating to science activities, including: definitions, year-to-year consistency and measurement. Consequently, the reader should be alerted to an estimated confidence interval of ± 15 per cent. It should also be noted that surveys involving different respondents (i.e. funders vs performers) can yield substantially different results. While Technology, Research and Telecommunications and Statistics Canada are working to resolve these limitations, and, while the data does offer reasonable order of magnitude estimates, caution is urged in drawing conclusions which exceed the rigor of the data.

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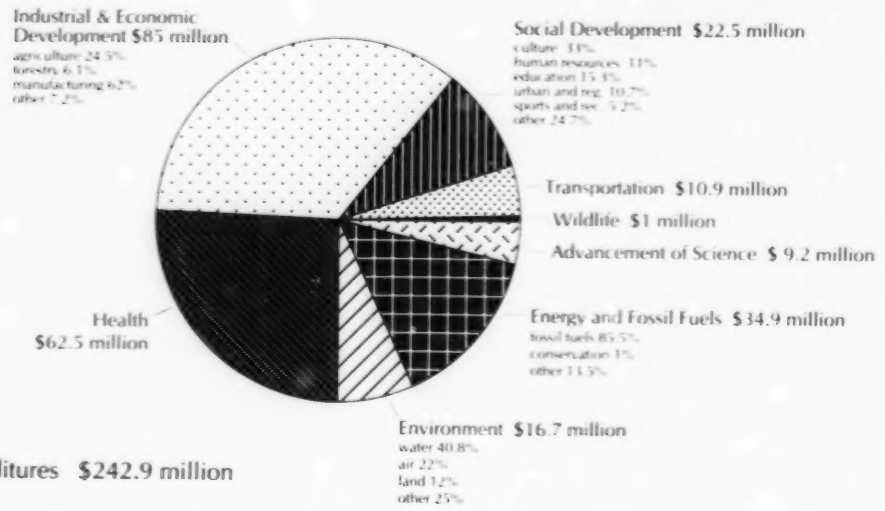
II. OBJECTIVES OF SCIENCE EXPENDITURES

Industrial development, health and energy were the main targets of 1987/88 science expenditures. As depicted in Figure I, activities in fulfillment of these three objectives accounted for 75 per cent of the year's science spending, $182.5 million of $242.9 million. The focus of industrial development was manufacturing, i.e. initiatives to encourage the production of new goods and services. Note that manufacturing captured about 22 per cent of all science expenditures. Energy science dollars were directed toward fossil fuels projects. Research and other science activities related to the exploration, extraction or refining of natural gas, crude oil and coal captured 85 per cent of the $34.9 million in energy science expenditures. Support to the advancement of science is closely associated with the fossil fuels programs as its funding is almost exclusively supplied by the energy ministry.

Expenditures related to health are predominantly basic medical research for the prevention and treatment of physical diseases.

The three main objectives depend on natural sciences and engineering capabilities, historically the dominant area of Alberta's science agenda. The social sciences generally command about 10 per cent of annual science expenditures. As shown in Figure I, social development science activities were aimed at community enrichment, for example, the museums programs included under culture or urban and regional development initiatives. Also under the social development umbrella are government planning tools, such as studies on labour force demands and re-training programs and the creation of statistical forecasting models.

FIGURE I
OBJECTIVES OF SCIENCE EXPENDITURES OF PROVINCIAL GOVERNMENT, 1987/88



Total Expenditures $242.9 million

III. MAJOR FUNDERS AND PERFORMERS

Various departments and agencies shape the government science agenda as performers and/or funders of research and related activities. Those with science expenditures exceeding $5 million are listed in Table I. The year's science agenda was largely the product of TRT, AHFMR and AOSTRA which collectively accounted for 57 per cent of total expenditures. Note that these three organizations are essentially funders of research that is performed by the university and industry sectors.

Technology, Research and Telecommunications (TRT) was the main financier of manufacturing science and technology development, supplying $51 million of the $52.8 million dedicated to that objective. The technology development was done by the universities and industry, of which TRT is the second largest source of government science funding, and by the Alberta Research Council of which TRT is the principal funder.

The Alberta Heritage Foundation for Medical Research (AHFMR) has been the mainstay of medical research funding since its creation in 1979. Its awards to university scientists accounted for $2 out of $3 for university performed research. In relation to the government's objective of health improvement, AHFMR awards constituted 80 per cent of the total expenditure. Other participants in the health agenda included the Environment ministry which used $3.9 million of its

TABLE I
MAJOR FUNDERS AND PERFORMERS OF PROVINCIAL GOVERNMENT SCIENCE AGENDA, 1987/88

FUNDER	TOTAL SCIENCE $	PERFORMERS IN-HOUSE*	INDUSTRY	UNIVERSITY	ARC	OTHER
				($ thousands)		
TR&T	51 297	360	13 544	11 617	25 772	4
AHFMR	51 167	1 418	—	46 897	—	2 852
AOSTRA	36 299	3 494	23 657	3 659	4 815	674
Environment[1]	26 682	21 673	3 458	203	310	1 038
Agriculture[2]	18 093	12 061	798	670	97	2 467
Transportation & Utilities	10 017	8 619	468	139	337	454
Culture	7 433	6 740	—	—	—	693
Forestry, Lands & Wildlife	6 715	5 107	812	359	337	100
Energy	6 248	475	4 469	468	630	206
Economic Dev't & Trade	5 391	4 143	1 129	24	5	90
Other	23 569	15 451	2 353	3 499	782	1 484
Total	242 911	79 541	50 688	69 535	33 085	10 062

[1] Combined Environment, Environmental Centre, Environmental Council
[2] Includes Agricultural Research Trust
* Includes administration of external awards

science budget for health related research and Community and Occupational Health. That department and its associated agencies, AADAC and the Mental Health Research Fund, contributed $2.5 million toward health improvement.

Hospitals and Health Care was the administrative agent for hospital-based medical research. Such indirect science funding is not captured by the survey. Approximately $2 million for applied cancer flowed through the department to the Alberta Cancer Board. Clinical research activities of special cardiac units were funded indirectly via the department's operating grants to hospitals. In 1986/87, direct support of such research was in the order of $18.5 million.

The Alberta Oil Sands Technology and Research Agency (AOSTRA), is the major source of government awards and contracts to industry for fossil fuels science and technology work. 70 per cent of its 1987/88 research budget was delegated to the private sector. Alberta Energy shows a comparable reliance on industry. These two organizations provided 55 per cent or $28 million of the total government science dollars spent in the private sector.

The other departments and agencies listed in Table 1 are essentially performers, consuming two thirds to 90 per cent of their science budgets on intramural activities. In dollars, Alberta Environment and the Environmental Centre were the largest science establishments within government. The Centre is a service organization for other departments; in 1987/88, it addressed the research requirements of Agriculture, Forestry, Lands and Wildlife, and Parks and Recreation. The intramural science activities of Culture, Transportation and Utilities, Agriculture, Forestry, Lands and Wildlife, and Economic Development and Trade were tied to their own programs and public policy mandates.

In the aggregate, intramural expenditures absorbed one third of the year's science budget. Universities were the leading extramural performers, capturing 29 per cent of science expenditures; industry accounted for 21 per cent, while the ARC accounted for 14 per cent.

IV. HUMAN RESOURCES

There is a human resources component to the intramural science expenditures. Salaries to scientists, technicians and administrative personnel accounted for $54.5 million (69 per cent) of intramural expenditures in 1987/88. Major employers of science personnel, those departments with 100 or more such employees, are shown in Table II. Environment and Agriculture had the largest concentration of science talent as was true in previous years. The four departments identified in Table II employed three out of four people of the government's science work force.

Note that personnel are grouped under research and development (R&D) or related science activities (RSA). In-house R&D tends to be concentrated in the natural sciences and engineering fields, the science capabilities most prominent in environmental and agricultural research. RSA is an umbrella term for an array of information services such as technical/statistical surveys, feasibility studies, testing and standards calibration and demonstration projects. Consistent with past years, the creation of prototypes and pilot plants is included in RSA when they are used to ascertain commercial operating characteristics and costs of an innovation. Throughout the 80's, the government's science work force has engaged predominantly in RSA. In 1987/88, four out of five scientific personnel provided information services.

TABLE II
SCIENCE PERSONNEL EMPLOYED BY THE PROVINCIAL GOVERNMENT IN 1987/88 (IN FULL-TIME EQUIVALENT PERSON YEARS)

MINISTRY	R & D	RSA	ADMINISTRATION	TOTAL
Environment[1]	154	294	8	456
Agriculture	142	271	12	425
Transportation & Utilities	12	167	2	181
Culture	—	149	—	149
Other	35	402	107	544
Total	343	1 283	129	1 755

(1) Combined Environment, Environmental Centre, Environmental Council

V. COMPARISONS OF ANNUAL EXPENDITURES

Scientific expenditures in 1987/88 were $90 million less than in 1986/87, a 27 per cent decrease. Almost half of this decline ($42.6 million) was occassioned by reduced AOSTRA expenditures. As reported last year, the original assignment of capital from the Alberta Heritage Savings Trust Fund (AHSTF) to AOSTRA was nearing exhaustion and the continuity of AOSTRA's activities required appropriations from the General Revenue Fund. The AHSTF was the source of $31.4 million in 86/87, down from $50 million in the previous year. In 87/88, the Fund provided $20.8 million and was supplemented by $26.9 million from the General Revenue Fund.

Bear in mind that part of the overall decrease is attributable to a change in administrative practice by Hospitals and Health Care. Thus, the change in annual funding of science activities should be pegged at 24.5 per cent and bracketed by a confidence internal of ± 5 per cent. In the context of the 80's, 1987/88 is an unprecedented shift in the government's science funding as shown in Table III.

The smaller purse for science had greatest impact on industry and university performers, a 44 per cent and 24 per cent decline respectively in the flow of public funds to these sectors. Least affected by the science budget cuts were the ARC (at 2.3 per cent) and intramural performers (at nine per cent).

As noted previously, industry and universities were closely associated with three funding organizations (AOSTRA, TRT and AHFMR) which are linked to key objectives of government's science agenda: fossil fuels, manufacturing technologies and health. Table IV details the impact on the industry and university sectors of 1987/88 spending levels of the three organizations.

TABLE III
TOTAL SCIENCE EXPENDITURES (IN MILLIONS) OF PROVINCIAL GOVERNMENT BY PERFORMER FOR THE 1980S

PERFORMER	80/81	82/83	84/85	86/87	87/88
intramural	29.5	80	92.1	87.5	79.5
industry	40.8	44.5	78.3	91.3	50.7
universities	13.1	39.2	45.8	91.2	69.5
hospitals	12.3	11.2	15.3	18.7	N/A*
ARC	20.6	32.3	38.6	33.8	33
other	3.5	5.5	6.6	10.9	9.3
Total	119.9	212.8	276.7	333.4	242.9
% Change		+77%	+30%	+20%	-27%

* Administrative charges within Hospitals and Health Care mask research funding to hospital based scientists

TABLE IV
KEY FUNDERS OF INDUSTRY AND UNIVERSITY PERFORMED SCIENCE ACTIVITIES IN 1987/88 AND 1986/87

	AOSTRA	AHFMR ($ IN '000S)	TR&T
1986/87 science expenditures	78 917	56 930	55 092
awards to industry performers	64 886	—	9 180
awards to university performers	3 429	54 304	22 269
1987/88 science expenditures	36 299	51 167	51 297
awards to industry performers	23 657	—	13 544
awards to university performers	3 659	46 897	11 619
change in 1986/87 & 1987/88 expenditures	-42 618	-5 763	-3 795
awards to industry performers	-41 229	—	+4 364
awards to university	-270	-7 407	-10 652

The estimates of 1988/89 science activities show a further reduction of seven per cent for a forecast total science budget of $225.9 million. In light of the time series presented in Table III, 1986/87 emerges as the peak year of government science activities, both in actual expenditures and in relative terms. For that year, the science program represented 4.6 per cent of all budgetary revenues and 3.1 per cent of all budgetary expenditures.

For 1987/88, the government science agenda accounted for 2.6 per cent of budgetary revenues and 2.4 per cent of budgetary expenditures. Based on the 1988/89 estimates, the respective science shares are 2.5 per cent and 2.0 per cent. Note that both revenues and expenditures of the provincial government were lower in 1986/87 than for the 1987 and 1988 fiscal years.

VI. COMPARISONS OF PROVINCIAL GOVERNMENTS

Several provinces conduct an annual survey of provincial government science activities, allowing a comparison of their levels of science funding. Table V presents a snapshot of the provinces' science expenditures. Two general observations arise from this data. First, the science expenditures of Ontario and Alberta are an order of magnitude greater than the other provinces'. The difference in levels of science expenditures has been consistent throughout the 80's. Secondly, the trend in funding saw increases in 1986/87 over 1985/86 expenditures and decreases in 1987/88 over 1986/87 expenditures. Only British Columbia and Newfoundland increased expenditures in the post 1985/86 years. The size of the cuts in the government science budgets was greatest in Alberta, both in actual dollars and relative terms.

In the context of total government expenditures, most of the provinces' science budgets account for one per cent. Alberta is the exception, allocating two per cent or more of total government expenditures to science activities.

TABLE V
TOTAL EXPENDITURES (IN $ MILLIONS) ON SCIENCE BY PROVINCIAL GOVERNMENTS, 1985/86 TO 1987/88

Province	EXPENDITURES 85/86	86/87	%Δ YEAR YEAR	EXPENDITURES 87/88	%Δ YEAR YEAR
Alberta	272.4	333.4	+22.4	242.9	-27
Ontario	262.4	362.4	+38	358.3	- 1.1
British Columbia	81.1	93.1	+14.8	113.2	+21.5
Saskatchewan	46.6	53.4	+15	47.1	-11.7
Manitoba	38.1	44.9	+17.8	36.9	-17.8
Nova Scotia	N/A	N/A	N/A	37.7	N/A
Newfoundland	24	24.8	+ 3.3	27.7	+11.6
New Brunswick*	22.1	20.9	- 5.4	22.7	N/A

* Prior to 1987/88, New Brunswick surveyed only natural science and engineering expenditures